In musicology, music psychology and related domains, the concept of 'musical expressivity' has been widely explored. It is considered a central component of musical performance and a carrier of emotions. The quality of the musical expression is a synthesis of composition, instrument and, most important, the performer.
Since the days of C. Seashore, the research on expressivity has been relying on methods of engineering. Initially only computer aided, with the increase in computational power fully automatic, music information retrieval nowadays helps modeling various aspects of musical performances like tempo, dynamics, articulation, intonation and vibrato.

Since the early 1990s, digital synthesis techniques are capable of rendering single sounds of classical instruments perfectly. A remaining problem, however, is the vivid synthesis of complete musical phrases, with the intrinsic expressiveness of acoustical instruments. This problem occurs in the fully automatic sonification of a musical score, as well as in digital musical instruments, played by a performer in real-time. This article focuses on the latter aspect, referred to as the 'control problem' after J.O. Smith III.
For overcoming this problem, much research is done on new musical interfaces and intelligent instruments, two paradigms which may offer a solution to this problem. Examples are given, how both approaches and their combination have been applied in the past.

The presented article investigates the above defined interdependency in the research on expressivity between the domain of sound analysis/synthesis and other disciplines, such as musicology, music education and music psychology.